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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/912,103	07/23/2001	Huong Thanh Nguyen	5619/DD/LOW K/JW	4476
32588	7590	11/09/2004	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			NGUYEN, KHIEM D	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 11/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/912,103

Applicant(s)

NGUYEN ET AL.

Examiner

Khiem D Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 13 (04/29/03).
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

New Grounds of Rejection

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(f) he did not himself invent the subject matter sought to be patented.

Claims 1-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Xu et al. (U.S. Patent 6,777,171).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention “by another,” or by an appropriate showing under 37 CFR 1.131.

Claims 1-24 are rejected under 35 U.S.C. 102(f) because the applicant did not invent the claimed subject matter.

In re claim 1, Xu discloses a method of fabricating a damascene structure, comprising: (a) forming a barrier layer **704** on a substrate **700** having a metal layer **702** thereon (col. 16, lines 21-38 and FIGS. 7A-B);

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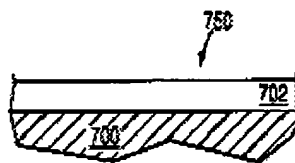


FIG. 7A

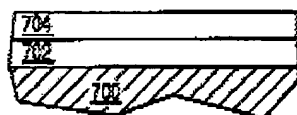


FIG. 7B

(b) forming a first organosilicate layer **705** on the barrier layer **704** (col. 16, lines 39-43 and FIG. 7C);

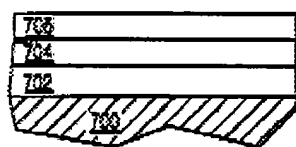


FIG. 7C

(c) forming a silicon oxide layer **706** on the first organosilicate layer **705** (col. 16, lines 44-57 and FIG. 7D);

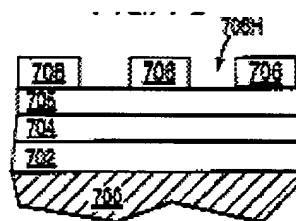


FIG. 7D

(d) forming a second organosilicate layer **708** on the silicon oxide layer **706** (col. 16, lines 58-65 and FIG. 7E); and

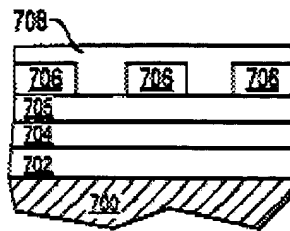


FIG. 7E

(e) etching the second organosilicate layer 708 to define vias 710 therein (col. 16, line 66 to col. 17, line 8 and FIG. 7F),

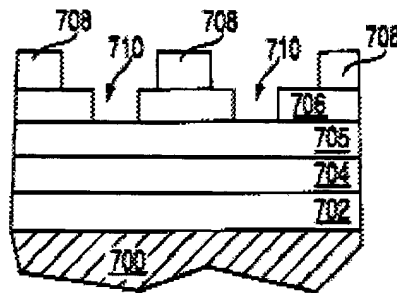


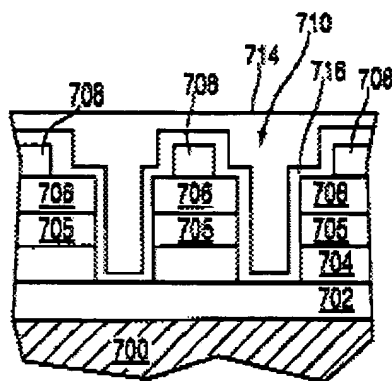
FIG. 7F

wherein the second organosilicate layer 708 is etched with a gas mixture comprising a hydrogen-containing fluorocarbon and one or more gasses selected from the group consisting of hydrogen (H₂), Nitrogen (N₂), oxygen (O₂), argon (Ar), and helium (He) (col. 14, line 8 to col. 15, line 63).

In re claim 2, Xu discloses that the method of claim 1, further comprising: (f) etching the silicon oxide layer 706 to transfer the vias 710 defined in the second organosilicate layer 708 therethrough (FIG. 7F); (g) patterning the second organosilicate layer 708 to define interconnects therethrough, wherein the interconnects are positioned over the vias, and wherein the via pattern is transferred through the first organosilicate layer when the interconnects are defined in the second organosilicate layer; and (g) filling

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the vias and interconnects 710 with a conductive material 714 (col. 16, line 58 to col. 17, line 18 and FIG. 7G).

**FIG. 7G**

In re claim 3, Xu discloses that the interconnects are defined in the second organosilicate layer 708 and the vias 710 are defined in the first organosilicate layer 705 using a hydrogen-containing fluorocarbon gas mixture (col. 9, lines 2-36 and FIG. 7G).

In re claim 4, Xu discloses that the conductive material 714 filling the vias 710 and interconnects is selected from the group of copper (Cu), aluminum (Al), tungsten (W), and combinations thereof (col. 17, lines 9-18 and FIG. 7G).

In re claim 5, Xu discloses that the gas mixture includes one or more gases selected from the group consisting of trifluoromethane (CHF_3), difluoromethane (CH_2F_2), and fluoromethane (CH_3F) (col. 15, lines 8-63).

In re claim 6, Xu discloses that the gas mixture further comprises a gas selected from the group consisting of carbon tetrafluoride (CF_4) and fluoroethane (C_2F_6), and combination thereof (col. 9, lines 3-36).

In re claim 7, Xu discloses that the gas mixture includes hydrogen (H_2) (col. 9, lines 3-36).

In re claim 8, Xu discloses that the second organosilicate layer is etched at a temperature within a range of about $-20^{\circ}C$ to about $80^{\circ}C$ (col. 9, lines 37-54).

In re claim 9, Xu discloses that the second organosilicate layer is etch at a pressure within a range of about 5 mtorr to about 1 torr (col. 9, lines 37-54).

In re claim 10, Xu discloses that the method of claim 1, further comprising applying an electric field to the hydrogen-containing fluorocarbon gas mixture (col. 9, lines 37-54).

In re claim 11, Xu discloses that the electric field is a radio frequency (RF) power (col. 9, lines 37-54).

In re claim 12, Xu discloses that the RF power is within a range of about 1 watt/cm² to about 100 watts/cm² (col. 9, lines 37-54).

In re claim 13, Xu discloses that the silicon oxide layer is etched with a fluorocarbon gas mixture (col. 11, lines 29-43).

In re claim 14, Xu discloses that the fluorocarbon gas mixture further comprises a gas selected from the group consisting of carbon tetrafluoride (CF_4) and fluoroethane (C_2F_6), and combination thereof (col. 9, lines 3-36).

In re claim 15, Xu discloses that the fluorocarbon gas mixture further includes one or more gases selected from the group consisting of hydrogen (H_2), nitrogen (N_2), oxygen (O_2), argon (Ar), and helium (He) (col. 9, lines 3-36).

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In re claim 16, Xu discloses that the silicon oxide layer is etched at a temperature within a range of about -20°C to about 80°C (col. 6, lines 19-58).

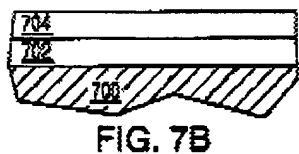
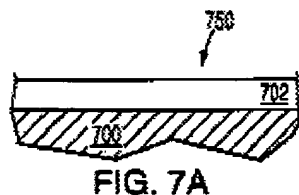
In re claim 17, Xu discloses that the silicon oxide layer is etch at a pressure within a range of about 5 mtorr to about 1 torr (col. 6, lines 19-58).

In re claim 18, Xu discloses that the method of claim 1, further comprising applying an electric field to the hydrogen-containing fluorocarbon gas mixture (col. 6, lines 19-58).

In re claim 19, Xu discloses that the electric field is generated using a radio frequency (RF) power (col. 6, lines 19-58).

In re claim 20, Xu discloses that the RF power is within a range of about 1 watt/cm² to about 100 watts/cm² (col. 6, lines 19-58).

In re claim 21, Xu discloses a method for fabricating a damascene structure, comprising: (a) forming a barrier layer 704 on a substrate 700 having a metal layer 702 thereon (col. 16, lines 21-38 and FIGS. 7A-B);



(b) forming a first organosilicate layer 705 on the barrier layer 704 (col. 16, lines 39-43 and FIG. 7C);

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FIG. 7C

(c) forming a silicon oxide layer 706 on the first organosilicate layer 705 (col. 16, lines 44-57 and FIG. 7D);

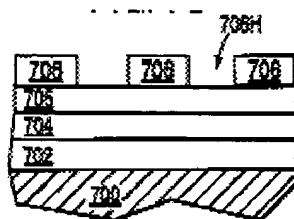


FIG. 7D

(d) forming a second organosilicate layer 708 on the silicon oxide layer 706 (col. 16, lines 58-65 and FIG. 7E); and

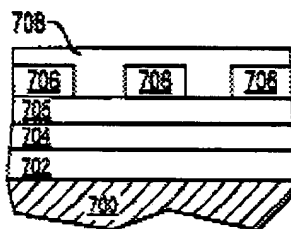


FIG. 7E

(e) etching the second organosilicate layer 708 to define vias 710 therein (col. 16, line 66 to col. 17, line 8 and FIG. 7F),

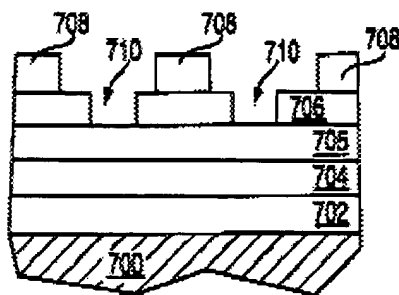


FIG. 7F

wherein the second organosilicate layer 708 is etched with a gas mixture comprising one or more hydrogen-containing fluorocarbon gases and one or more gasses selected from the group consisting of hydrogen (H_2), Nitrogen (N_2), oxygen (O_2), argon (Ar), and helium (He) (col. 14, line 8 to col. 15, line 63); and

(f) etching the silicon oxide layer 706 to transfer the vias 710 defined in the second organosilicate layer 708 therethrough (FIG. 7F), wherein the silicon oxide layer is etched with a gas mixture comprising a fluorocarbon gas (col. 11, lines 29-43).

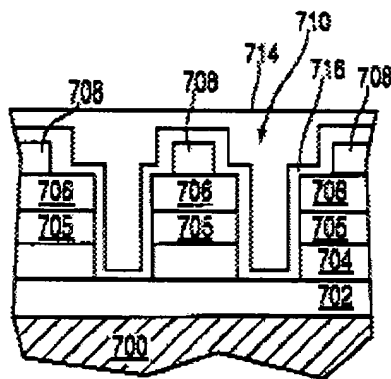


FIG. 7G

In re claim 22, Xu discloses that the gas mixture for etching the second organosilicate layer comprises hydrogen (H_2) (col. 9, lines 3-36).

In re claim 23, Xu discloses that the gas mixture for etching the second organosilicate layer comprises trifluoromethane (CHF_3), dimethylfluoride, and hydrogen (col. 15, lines 8-63).

In re claim 24, Xu discloses that the gas mixture for etching the second organosilicate layer comprises difluoromethane, tetrafluoride, and hydrogen (col. 9, lines 3-36).

Response to Applicant's Arguments and Amendment

Applicant's arguments with respect to claims 1-20 and 21-24 have been considered but are moot in view of the new ground(s) of rejection.

Applicants contend that the reference Flanner et al. (U.S. Patent 6,410,437) herein known as Flanner does not teach, show, or suggest a gas mixture comprising a hydrogen-containing fluorocarbon for etching an organosilicate layer, as recited in the base claims. Furthermore, Applicants stated that Flanner et al. does not motivate or suggest a gas mixture comprising a hydrogen-containing fluorocarbon and one or more gases selected from the group consisting of hydrogen (H_2), nitrogen (N_2), oxygen (O_2), argon (Ar), and helium (He) for etching an organosilicate layer, as recited in the base claims.

In response to Applicants' contention that Flanner does not teach, show, or suggest a gas mixture comprising a hydrogen-containing fluorocarbon for etching an organosilicate layer and that Flanner et al. does not motivate or suggest a gas mixture comprising a hydrogen-containing fluorocarbon and one or more gases selected from the group consisting of hydrogen (H_2), nitrogen (N_2), oxygen (O_2), argon (Ar), and helium (He) for etching an organosilicate layer, as recited in the base claims, Examiner

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respectfully disagrees. Since Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. The newly discovered reference, Xu et al. (U.S. Patent 6,777,171) disclose the above deficit limitations as previously fail to teach by Flanner. Thus, Applicants' arguments are moot. For these reasons, Examiner holds the rejection proper.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K.N.
November 4th, 2004



**W. DAVID COLEMAN
PRIMARY EXAMINER**